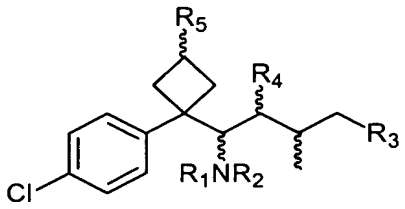
THE CLAIMS

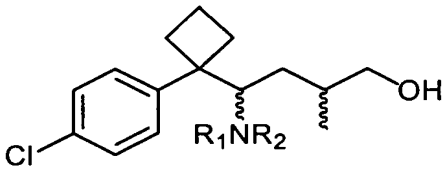
What is claimed is:

1. A compound of the formula:



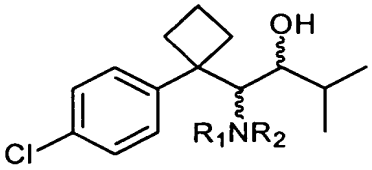
or a pharmaceutically acceptable salt, solvate, hydrate, clathrate, or prodrug thereof, wherein each of R_1 and R_2 is independently lower alkyl or hydrogen, and each of R_3, R_4, and R_5 is independently hydrogen, hydroxyl, or alkoxy, provided that: at least one of R_3, R_4, and R_5 is not hydrogen; if each of R_1, R_2, R_4, and R_5 is hydrogen and R_3 is hydroxyl, the compound is not racemic; and if each of R_1, R_2, R_3, and R_4 is hydrogen and R_5 is hydroxyl, the compound is not racemic.

2. A compound of the formula:



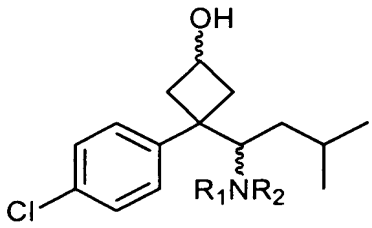
or a pharmaceutically acceptable, salt, solvate, hydrate, clathrate, or prodrug thereof, wherein each of R_1 and R_2 is independently alkyl or hydrogen, provided that if R_1 and R_2, are both hydrogen, the compound is not racemic.

3. A compound of the formula:



or a pharmaceutically acceptable, salt, solvate, hydrate, clathrate, or prodrug thereof, wherein each of R_1 and R_2 is independently alkyl or hydrogen.

4. A compound of the formula:



a pharmaceutically acceptable, salt, solvate, hydrate, clathrate, or prodrug thereof, wherein each of R_1 and R_2 is independently alkyl or hydrogen, provided that if both R_1 and R_2 are hydrogen, the compound is not racemic.

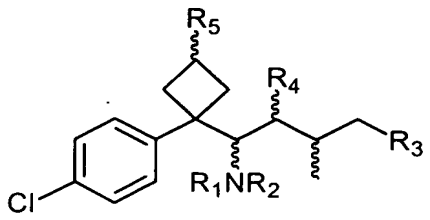
5. The compound of claim 1, 2, 3, or 4, wherein at least one of R_1 or R_2 is hydrogen.

6. The compound of claim 1, 2, 3, or 4, wherein at least one of R_1 or R_2 is methyl.

7. The compound of claim 1, 2, 3, or 4, wherein the compound is stereomerically pure.

8. The compound of claim 1, 2, 3, or 4, wherein the compound is an enantiomeric or diastereomeric mixture that is not a racemic mixture.

9. A method of treating or preventing a disease or disorder ameliorated by inhibition of neuronal monoamine uptake, which comprises administering to a patient in need of such treatment or prevention a therapeutically or prophylactically effective amount of a compound of the formula:



or a pharmaceutically acceptable salt, solvate, hydrate, clathrate, or prodrug thereof, wherein each of R_1 and R_2 is independently lower alkyl or hydrogen, and each of R_3, R_4, and R_5 is independently hydrogen, hydroxyl, or alkoxy, provided that at least one of R_3, R_4, and R_5 is not hydrogen.

10. The method of claim 9, wherein if R_1, R_2, R_4, and R_5 are each hydrogen and R_3 is hydroxyl, the compound is not racemic, and if R_1, R_2, R_3, and R_4 are each hydrogen and R_5 is hydroxyl, the compound is not racemic.

11. The method of claim 9, wherein the disease or disorder ameliorated by inhibition of neuronal monoamine uptake is an eating disorder, an obsessive-compulsive disorder, platelet adhesion, apnea, an affective disorder, anxiety, a male or female sexual function disorder, restless leg syndrome, osteoarthritis, substance abuse, pain, migraine, a cerebral function disorder, a chronic disorder, or incontinence.

12. The method of claim 11 wherein the eating disorder is weight gain or obesity.

13. The method of claim 11 wherein the affective disorder is depression, attention deficit disorder, a bipolar or manic condition, dysthymic disorder, or cyclothymic disorder.

14. The method of claim 11 wherein the pain is neuropathic pain.

15. The method of claim 11 wherein the cerebral function disorder is dementia, memory loss, autism, epilepsy, hyperkinetic syndrome, or schizophrenia.

16. The method of claim 11 wherein the chronic disorder is narcolepsy, chronic fatigue syndrome, seasonal affective disorder, fibromyalgia, or premenstrual syndrome.

17. The method of claim 9, wherein at least one of R_1 or R_2 is hydrogen and at least one of R_3, R_4, or R_5 is hydroxyl.

18. The method of claim 9, wherein at least one of R_1 or R_2 is methyl and at least one of R_3, R_4, or R_5 is hydroxyl.

19. The method of claim 9, wherein the compound is stereomerically pure.

20. The method of claim 9, wherein the compound is an enantiomeric or diastereomeric mixture that is not a racemic mixture.

21. The method of claim 9, wherein the compound is hydroxylated sibutramine or a hydroxylated sibutramine metabolite.

22. The method of claim 21, wherein the compound is hydroxylated in the 1-position.

23. The method of claim 21, wherein the compound is hydroxylated in the 3-position.

24. The method of claim 21, wherein the compound is hydroxylated in the 7-position.

25. The method of claim 9, wherein the amount administered is from about 0.01 mg to about 500 mg/day.

26. The method of claim 25, wherein the amount administered is from about 0.1 mg to about 250 mg/day.

27. The method of claim 25, wherein the amount administered is from about 1 mg to about 100 mg/day.

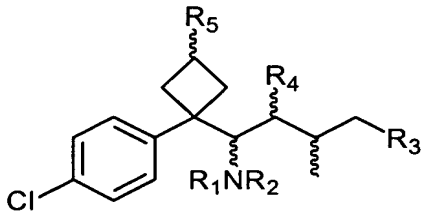
28. The method of claim 9, wherein the compound is administered orally, mucosally, parenterally, or transdermally .

29. The method of claim 9 further comprising administering a 5-HT_3 antagonist.

30. The method of claim 29, wherein the 5-HT_3 antagonist is an antiemetic agent.

31. The method of claim 29, wherein the 5-HT_3 antagonist is granisetron, metoclopramide, ondansetron, renzapride, zacopride, tropisetron, or a stereomerically pure stereoisomer, active metabolite, or pharmaceutically acceptable salt, solvate, hydrate, ester, clathrate, or prodrug thereof.

32. A pharmaceutical composition comprising a therapeutically or prophylactically effective amount of a racemic or stereomerically pure compound of formula:



or a pharmaceutically acceptable salt, solvate, hydrate, clathrate, or prodrug thereof, wherein each of R_1 and R_2 is independently lower alkyl or hydrogen, and each of R_3, R_4, and R_5 is independently hydrogen, hydroxyl, or alkoxy, provided that at least one of R_3, R_4, and R_5 is not hydrogen.

33. The pharmaceutical composition of claim 32, wherein if R_1, R_2, R_4, and R_5 are each hydrogen and R_3 is hydroxyl, the compound is not racemic, and if R_1, R_2, R_3, and R_4 are each hydrogen and R_5 is hydroxyl, the compound is not racemic.

34. The pharmaceutical composition of claim 32, wherein at least one of R_1 or R_2 is hydrogen and at least one of R_3, R_4, or R_5 is hydroxyl.

35. The pharmaceutical composition of claim 32, wherein at least one of R_1 or R_2 is methyl and at least one of R_3, R_4, or R_5 is hydroxyl.

36. The pharmaceutical composition of claim 32, wherein the compound is stereomerically pure.

37. The pharmaceutical composition of claim 32, wherein the compound is an enantiomeric or diastereomeric mixture that is not racemic.

38. The pharmaceutical composition of claim 32, wherein the compound is hydroxylated sibutramine or a hydroxylated sibutramine metabolite.

39. The pharmaceutical composition of claim 38, wherein the compound is hydroxylated in the 1-position.

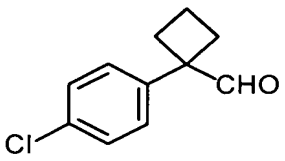
40. The pharmaceutical composition of claim 38, wherein the compound is hydroxylated in the 3-position.

41. The pharmaceutical composition of claim 38, wherein the compound is hydroxylated in the 7-position.

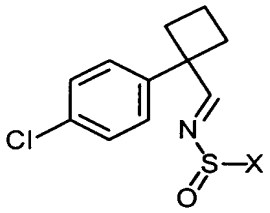
42. The pharmaceutical composition of claim 32, wherein the pharmaceutical composition is adapted for oral, mucosal, rectal, parenteral, or transdermal administration.

43. The pharmaceutical composition of claim 32, wherein said composition is lactose-free.

44. A method of synthesizing a hydroxylated compound, which comprises contacting an aldehyde of formula:

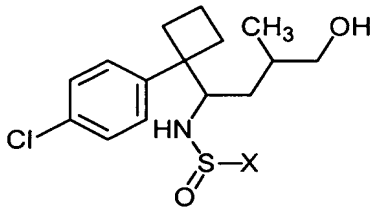


with a first sulfinamide under reaction conditions suitable for the formation of a sulfinimine of formula:



wherein X is an auxiliary group;

contacting said sulfinimine with an organometallic reagent under reaction conditions suitable for the formation of a second sulfinamide of formula:



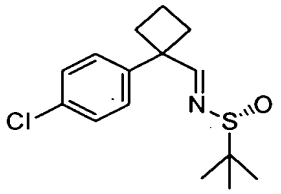
and contacting said second sulfinamide with a reagent under reaction conditions suitable for the removal of a sulfinyl group to form a hydroxylated compound of formula:

herein each of R_1 and R_2 is independently hydrogen or lower alkyl.

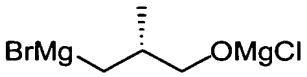
45. The method of claim 44, wherein the hydroxylated compound is stereomerically pure.

46. The method of claim 44, wherein the first sulfinamide is stereomerically pure (R)-tert-butylsulfinamide or stereomerically pure (S)-tert-butylsulfinamide.

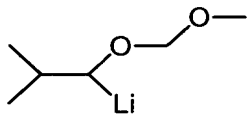
47. The method of claim 44, wherein the first sulfinimine is of the formula:



48. The method of claim 44, wherein the organometallic reagent is of the formula:



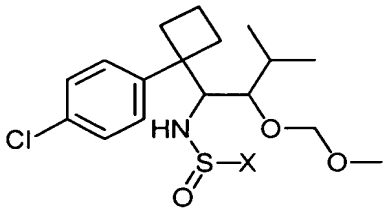
or



49. The method of claim 44, which further comprises contacting with an N-methylating agent with the hydroxylated compound under reaction conditions suitable for the formation of an N-methyl amine.

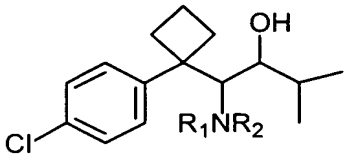
50. The method of claim 49, wherein the N-methylating agent is formic acid and borane.

51. The method of claim 44, wherein the organometallic reagent is added under reaction conditions suitable for the formation of a compound of formula:

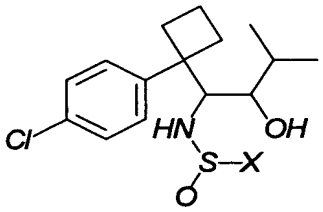


wherein X is an auxiliary group.

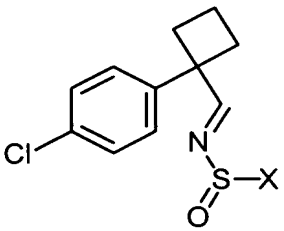
52. A method of making a hydroxylated compound of the formula:



wherein each of R_1 and R_2 is independently hydrogen or alkyl, which comprises treating a first sulfinimine of the formula:



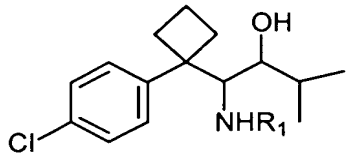
wherein X is an auxiliary with an organometallic agent under reaction conditions suitable for the formation of a second sulfinamide of the formula:



and contacting the second sulfinamide with a deprotecting agent under reaction conditions sufficient for the removal of a sulfinyl group.

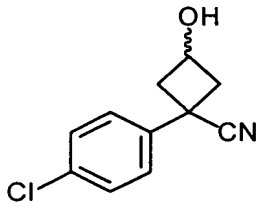
53. The method of claim 52, wherein the hydroxylated compound is stereomerically pure.

54. The method of claim 52, wherein the hydroxylated compound is subjected to reaction conditions suitable for N-methylation to form a compound of formula:



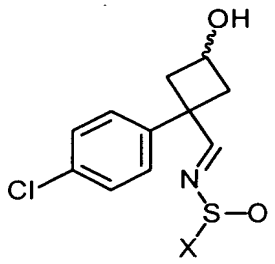
wherein R_1 is methyl.

55. A method for synthesizing a hydroxylated compound, which comprises contacting 4-chlorophenylacetonitrile with a compound under reaction conditions suitable for the formation of a compound of formula:



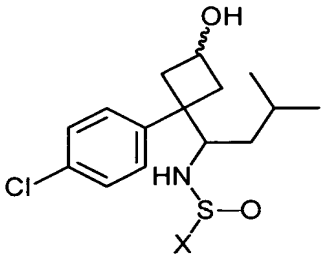
reducing the nitrile under reaction conditions suitable for the formation of an aldehyde;

contacting the aldehyde with a tert-butyl sulfinimine under reaction conditions suitable for the formation of a first sulfinamide compound of formula:



wherein X is an auxiliary;

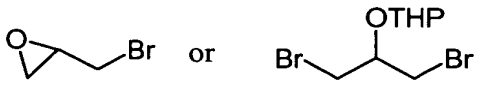
contacting said first sulfinamide compound with an organometallic agent under reaction conditions suitable for the formation of a second sulfinamide of the formula:



and contacting the second sulfinamide with a deprotecting agent under reaction conditions sufficient to form the hydroxylated compound.

56. The method of claim 55, wherein the hydroxylated compound is stereomerically pure.

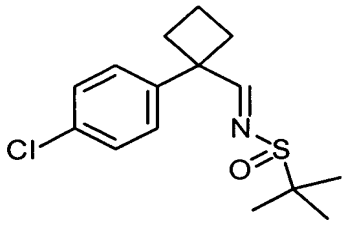
57. The method of claim 55, wherein the 4-chlorophenylacetonitrile is contacted with a compound of the formula:



58. The method of claim 55, wherein the reducing agents is Dibal-H.

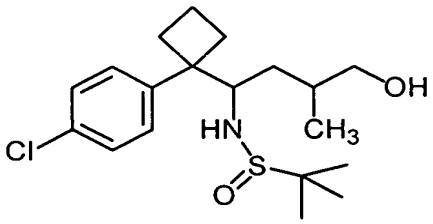
59. The method of claim 55, wherein the organometallic is isopropylmagnesium chloride.

60. A compound of the formula:



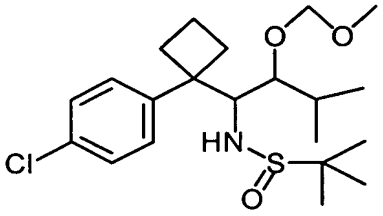
or a salt, solvate, or hydrate thereof.

61. A compound of the formula:



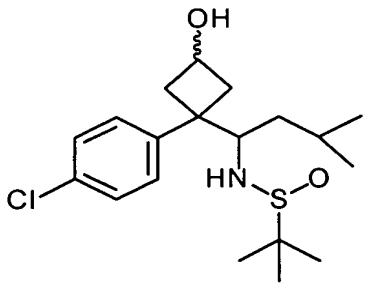
or a salt, solvate, or hydrate thereof.

62. A compound of the formula:



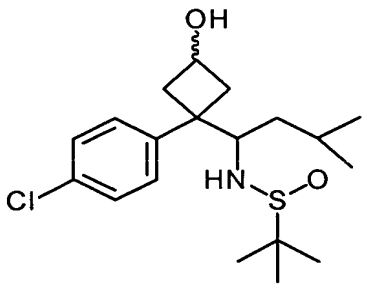
or a salt, solvate, or hydrate thereof.

63. A compound of the formula:



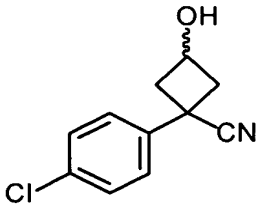
or a salt, solvate, or hydrate thereof.

64. A compound of the formula:



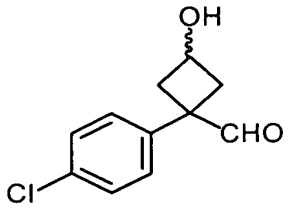
or a salt, solvate, or hydrate thereof.

65. A compound of the formula:



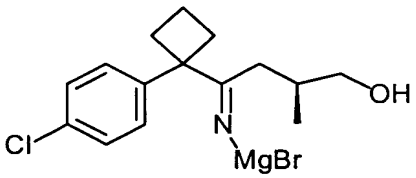
or a salt, solvate, or hydrate thereof.

66. A compound of the formula:

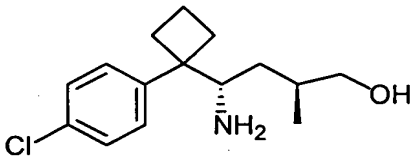


or a salt, solvate, or hydrate thereof.

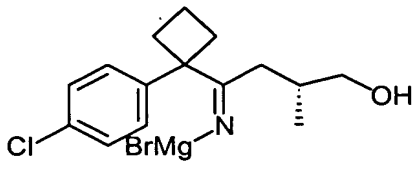
67. A method of providing a reduced compound, which comprises contacting a compound of the formula:



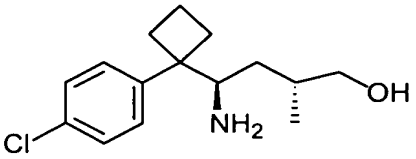
with a borane-reducing agent under reaction conditions suitable for the formation of a stereomerically pure compound of the formula:



68. A method of providing a reduced compound, which comprises contacting a compound of the formula:



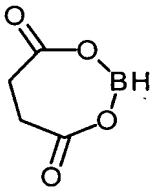
with a borane-reducing agent under reaction conditions suitable for the formation of a stereomerically pure compound of the formula:



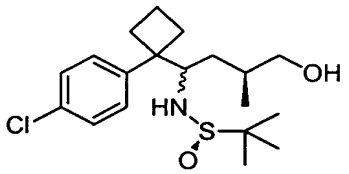
69. The method of claim 67 or 68 wherein the borane reducing agent is formed by contacting borane-tetrahydrofuran with succinic acid.

70. The method of claim 67 or 68, wherein the borane reducing agent is formed by contacting borane-tetrahydrofuran with salicyllic acid.

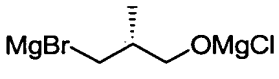
71. A compound of the formula:



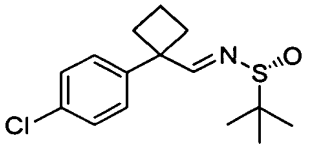
72. A method of synthesizing a sulfinamide of the formula:



which comprises contacting an organometallic agent of the formula:



with a compound of the formula:



under reaction conditions sufficient for the formation of the sulfinamide.

73. The method of claim 72, wherein the sulfinamide, organmetallic agent, and sulfinimine are stereomerically pure.

5